Peter M. Pak

Pittsburgh, PA | ppak10 | ppak.net | ppak10@gmail.com | U.S. Citizen

Education

Carnegie Mellon University — **Pittsburgh, PA**

- Doctor of Philosophy (GPA: 3.88 / 4.00) — June 2023 – July 2026
- Master of Science in Additive Manufacturing (GPA: 4.00 / 4.00) — August 2022 – May 2023
- Bachelor of Science in Materials Science and Engineering (GPA: 3.09 / 4.00) — August 2014 – May 2018
  - Minor in Biomedical Engineering

Publications (8)

Peter Pak, Amir Barati Farimani. "AdditiveLLM2: A Multi-modal Large Language Model for Additive Manufacturing" *arXiv* (2026)

Ziyue Wang, Yayati Jadhav, **Peter Pak**, Amir Barati Farimani. "Image2Gcode: Image-to-G-code Generation for Additive Manufacturing Using Diffusion-Transformer Model" *Additive Manufacturing Letters* (2026)

Peter Pak, Achuth Chandrasekhar, Amir Barati Farimani. "Agentic Additive Manufacturing Alloy Evaluation" *Additive Manufacturing Letters* (2026)

Yayati Jadhav, **Peter Pak**, Amir Barati Farimani. "LLM-3D Print: Large Language Models to Monitor and Control 3D Printing" *Additive Manufacturing* (2025)

Peter Pak, Amir Barati Farimani. "AdditiveLLM: Large language models predict defects in metals additive manufacturing" *Additive Manufacturing Letters* (2025)

Francis Ogoke, **Peter Pak**, Alexander Myers, Guadalupe Quirarte, Jack Beuth, Jonathan Malen, Amir Barati Farimani. "Deep learning for melt pool depth contour prediction from surface thermal images via vision transformers" *Additive Manufacturing Letters* (2024)

Abraham George, Yibo Chen, Atharva Dikshit, Selam Gano, **Peter Pak**, Amir Barati Farimani. "BeadSight: An Inexpensive Tactile Sensor Using Hydro-Gel Beads" *IEEE Sensors Journal* (2024)

Peter Pak, Francis Ogoke, Andrew Polonsky, Anthony Garland, Dan S Bolintineanu, Dan R Moser, Michael J Heiden, Amir Barati Farimani. "ThermoPore: Predicting Part Porosity Based on Thermal Images Using Deep Learning" *Journal of Additive Manufacturing* (2024)

Conference Presentations (6)

Peter Pak, Amir Barati Farimani. "finetune.build: A Multi-Agent Platform Enabling Process Control Within Additive Manufacturing" 2025 Annual International Solid Freeform Fabrication Symposium, Austin, TX, August 2025. Conference Presentation

Peter Pak, Amir Barati Farimani. "Large Language Model enabled Process Map Discovery Within Additive Manufacturing" 2025 Annual International Solid Freeform Fabrication Symposium, Austin, TX, August 2025. Conference Presentation

Peter Pak, Francis Ogoke, Amir Barati Farimani. "Additive Manufacturing Digital Twin (AMDT): Part Level Process Map Characterization Using Physics Based Simulation and Machine Learning" 2025 TMS Annual Meeting & Exhibition, Las Vegas, NV, March 2025.

Peter Pak, Francis Ogoke, Achuth Chandrasekhar, Olabode Ajenifujah, Amir Barati Farimani. "Additive Manufacturing User Interface (AMUI): An Intuitive Software Suite for Part Level Process Parameter Selection" 2025 TMS Annual Meeting & Exhibition, Las Vegas, NV, March 2025.

Peter Pak, Francis Ogoke, Amir Barati Farimani. "Pre-training Vision Encoders with Thermal Images for in-situ Process Monitoring in Laser Powder Bed Fusion" 2024 Annual International Solid Freeform Fabrication Symposium, Austin, TX, August 2024. Conference Presentation

Peter Pak, Francis Ogoke, Andrew Polonsky, Anthony Garland, Dan S Bolintineanu, Dan R Moser, Michael J Heiden, Amir Barati Farimani. "Pyrometry Mapping of Segmented Porosity in Computed Tomography" TMS Specialty Congress, 2nd World Congress on Artificial Intelligence in Materials & Manufacturing, Cleveland, OH, June 2024. Conference Presentation

Research

Dr. Amir Barati Farimani's Mechanical and Artificial Intelligence Laboratory — August 2022 – July 2026

- Proposed thesis work for the *Continual Learning Enabled Agentic Additive Manufacturing Process Optimization*
- Developed agentic systems for the end-to-end design and construction of 3D printed rockets (*RocketSmith*) and for the search, testing, and evaluation of additive manufacturing alloys (*Agentic Additive Manufacturing Alloy Evaluation*)
- **ARM Institute Development Fund** sponsored project for robotics enabled contrastive learning pipeline for the assessment of grind surface quality of a deposited weld bead using optical depth cameras and tactile sensors.
- **RTX** sponsored project for linking infrared images of spatter generation within a Ti-6Al-4V LPBF build to porosity detected by computed tomography using filters and computer vision techniques.
- **Army Research Lab** sponsored project to develop a full-stack application to assist non-specialists in selecting optimal parameters through guidance in process map optimization, increasing the overall likelihood of a successful print.
- **Sandia National Laboratories** sponsored project for porosity quantification and localization machine learning models within LPBF to predict *ex-situ* part characteristics given a sequence of thermal images captured with an *in-situ* two color pyrometer.

Dr. Lisa Porter's Gallium Oxide Research Group — May 2016 – August 2018

- Assisted in the development of experimental procedures and desired temperature profiles to epitaxially grow gallium oxide layers.
- Constructed steel support structure to raise and orient tube furnace at 20° incline to adequately coat sapphire substrate with gallium oxide flux mixture.

Work Experience

Carnegie Mellon University

Graduate Research Assistant — January 2026 – Present
Head Teaching Assistant (24-880 AI Agents for Engineers) — January 2026 – Present
Teaching Assistant (24-621 AI Mechanics I – 2D Design) — August 2025 – December 2025

Emeritus

Subject Matter Expert (Agentic AI Program) — January 2026 – Present

LOU Technologies (acquired by Totango)

Software Developer — April 2020 – August 2022

Modontics

Software Developer — June 2019 – December 2019

Maven Machines

Front-end Developer — October 2018 – April 2019

Proficient Skills and Technologies

Languages: TypeScript | Python

Manufacturing Processes: Fused Deposition Modeling (FDM) | Selective Laser Sintering (SLS) | Stereolithography (SLA) | Laser Powder Bed Fusion (LPBF) | Computer Numeric Control (CNC)

Preferred Software Tools: GitHub | HuggingFace | Model Context Protocol (MCP) | NeoVim | Docker | Solidworks | MasterCAM

Affiliations and Leadership

Carnegie Mellon Rocket Command — September 2022 – Present

Tripoli Pittsburgh — November 2022 – Present

Member (Level 1 Certified)

Boy Scouts of America - Troop 2 Santa Monica — September 2008 – August 2014

Senior Patrol Leader (Eagle Scout)